Small is Beautiful: Scaling Adaptive Management To Fit a Range of Riverine Systems

Submitted to:

The CALFED Watershed Program

by:

Natural Heritage Institute
&
University of California, Berkeley

June 2002

PART A – COVER PAGE

STATE WATER RESOURCES CONTROL BOARD
SFY 2002 Costa-Machado Water Act of 2000
CALFED Watershed Program

Application No. **563**

PROJECT TITLE: **Small is Beautiful: Scaling Adaptive Management to Fit a Range of Riverine Systems**

Project Region _____ Indicate RWQCB #: _____
Multi-regional Project X Indicate RWQCB #s: _____
Statewide Project _____

PROJECT DIRECTOR (one name only) (Ms., Mr., **Dr**.): **Elizabeth A. Soderstrom** **6/3/02**
PRINT DATE

LEAD APPLICANT OR ORGANIZATION: **The Natural Heritage Institute**

TYPE OF AGENCY:

Municipality _____ Local Agency _____ *Nonprofit (non-landowner) X

Nonprofit (landowner) _____ Local Public Agency _____

STREET ADDRESS: **409 Spring Street**
CITY: **Nevada City** Zip Code: **95959**
P.O. BOX: **PO Box 559** Zip Code: **95959**
COUNTY: **Nevada**
STATE: **California**

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PROJECT TYPE: **Monitor Watersheds; Watershed Management Plan**

LEGISLATIVE INFORMATION

Senate District **01** Assembly District **03**

United States Congressional District **2nd**

CALFED, RWQCB, or SWRCB STAFF CONTACTED REGARDING THIS PROPOSAL:

Contact:		Contact:	
Phone No.:		Phone No.:	
Dates contacted:		Dates contacted:	

PRIMARY COOPERATING ENTITIES:

Entity Name:	University of California, Berkeley		
Role/Contribution to Project:	Assistance to Rural/Urban Communities		
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Entity Name:	Four Fox Consulting		
Role/Contribution to Project:	Assistance on data base analysis		
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WATERBODY/ WATERSHED

This project will have impact on watersheds that serve many small rural and urban financial hardship communities. Specific sites for pilot projects will be identified as part of the project. Project proponents have had discussions regarding pilot projects managed by Modoc RCD (Upper Pit River Watershed Enhancement and Protection Program), Western Shasta RCD (Lower Clear Creek Floodway Restoration), East Lake and West Lake RCDs (Middle Creek, Schindler Creek and others), Plumas Corp (Feather River and tributaries), Friends of Deer Creek (Deer Creek-Nevada County), Urban Creeks Council (Rheem Creek-Contra Costa County), Friends of Sausal Creek (Sausal Creek-Alameda County), Delta Science Center (Marsh Creek and Dutch Slough-Contra Costa County) and Friends of Codornices Creek (Codornices Creek Watershed Restoration Action Plan-lameda County).

GPS COORDINATES FOR PROJECT LOCATION, IF AVAILABLE: _____

FISCAL SUMMARY:

Proposition 13 Funds Requested	**$183,500**
Other Project Funds	$ 40,000*
Total Project Budget	$223,500

* Natural Heritage Institute has secured $30,000 from the Switzer Foundation and $10,000 from the Hewlett Foundation in support of this work

CERTIFICATION

Please read before signing.

I certify under penalty of perjury that the information I have entered on this application is true and complete to the best of my knowledge and that I am entitled to submit the application on behalf of the applicant (if the applicant is an entity/organization). I further understand that any false, incomplete, or incorrect statements may result in the disqualification of this application. By signing this application, I waive any and all rights to privacy and confidentiality of the proposal on behalf of the applicant, to the extent provided in this RFP.

_____

Applicant Signature Date

Dr. Elizabeth A. Soderstrom

Printed Name of Applicant

PART B – SMALL IS BEAUTIFUL

Project Goals and Objectives. Adaptive management is the proposed strategy for coping with the uncertainty inherent in ecosystem management. It is an essential feature of resource management because it allows a realistic response to ignorance about the ecosystem by monitoring the results of management efforts and adjusting strategies as needed. Although widely touted, adaptive management is currently preached more than it is practiced.

In reality, adaptive management is far more complicated than simply applying the scientific method to natural resources management; it requires a fundamental shift in our approach to resource problems. In the cases where adaptive management is being practiced, we are starting to acquire "lessons-learned" about how best to apply this new approach. These cases, however, are mostly large-scale ecosystem restoration projects underway in such places as the Florida Everglades, the Columbia and Colorado River Systems, and the Chesapeake Bay.

Here lies the issue that this project is designed to address: a significant amount of restoration work is being undertaken on a small watershed or sub-basin scale, but the examples of how to apply adaptive management are derived from large-scale ecosystem restoration efforts implemented by teams of scientists and managers with relatively large budgets. There is much to be learned from applying adaptive management to small-scale systems with limited institutional capacity and financial resources, but a new model of adaptive management that recognizes these constraints needs to be developed in order to capture the knowledge that will arise from these smaller experiments.

This project aims to assist financial hardship, small rural and urban communities with the development of appropriate adaptive management plans that support their riverine and riparian restoration activities and contribute to an overall understanding of river function and restoration. In addition to this direct assistance to on-the-ground activities at a community level, this project will leverage that experience into a draft model for how to apply adaptive management to smaller-scale systems. This experience and information will be distributed widely in a range of ways, including through the publication of a Primer for Applying Adaptive Management in Smaller-Scale Restoration Projects.

The overall goal of Small is Beautiful: Scaling Adaptive Management to Fit a Range of Riverine Systems (Small is Beautiful) is to operationalize the concept of adaptive management to support small-scale restoration and watershed management efforts. **Specific objectives** include the following:

- To identify and develop pilot projects in 5-6 small rural and urban hardship communities and assist in the application of adaptive management to restoration projects;
- To develop and widely disseminate a Primer for Applying Adaptive Management in Smaller-Scale Restoration Projects based on literature review and experience with pilot projects; and
- To effectively apply adaptive management to small-scale systems to generate meaningful and transferable information about river function and restoration.

Problem Statement. Over the last five years, the Natural Heritage Institute (NHI) and our project partners have gained significant experience in watershed management and restoration in the Bay-Delta system and beyond. Into this restoration and management work, we have begun to integrate the concepts of adaptive management (including our work in the Yolo Bypass, the Guadalupe River, Marsh Creek, and river systems in southern Africa – please see additional descriptions in Part H). Because the concept of adaptive management was developed in the context of large-scale ecosystem management, we have encountered a mismatch between the existing model for adaptive management and our smaller-scale needs.

In the last year, we have broadened our discussion of adaptive management to include additional partners and colleagues, including presenting a paper on this concept to an international conference in Cape Town, South Africa.[1] We have found that many other watershed managers gravitate towards embracing this new management idea, but are also having difficulty in translating the models of adaptive management that are readily available (such as those on the Colorado or Columbia rivers) to their smaller-scale efforts.

More recently, we have begun discussions with a range of watershed management groups in California, including those listed in Table 1 below. The common theme throughout all of these discussions was agreement that the application of adaptive management was proving to be difficult with limited funds and personnel. In addition, there exists significant confusion surrounding the concept of adaptive management. Practitioners are struggling with such questions as:

1. What is the difference between adaptive management and monitoring?
2. What should we include in a conceptual model?
3. Do we need to do numerical modeling to understand our system? If so, which model should we use?
4. How do we design our restoration actions as management interventions?
5. How do we set up a collaborative learning process that involves a range of stakeholders?
6. What institutional and legal arrangements are needed to promote adaptive management in our watershed?
7. What is the difference between active and passive adaptive management?
8. How do we tease apart the inherent variability in the system from the impact of our restoration work?
9. Are there other groups trying to implement adaptive management on a small scale? What are they doing and can we coordinate with them?
10. How do we determine which are the controlling processes in our system?
11. We see significant changes in our monitoring data, but how do we know when it is necessary to change our management intervention?

Helping to answer these questions and others like them for a broad range of watershed management practitioners is the central aim of this project.

[1] The conference was entitled: Environmental Flows for River Systems and was part of the 4th International Ecohydraulics Symposium.

Table 1: Potential Project Partners for the Pilot Stage of the Project

County	Agency/Organization	Contact	Project Name
Shasta	Western Shasta RCD	Hide Wenham	Lower Clear Creek Floodway Restoration Project
Modoc	Modoc RCD	Cliff Harvey	Upper Pit River Watershed Enhancement and Protection Program
Plumas	Plumas Corp	Jim Wilcox	Various projects on the Feather River and tributaries
Lake	East Lake and West Lake RCDs	Greg Dills	Middle Creek Ecosystem Restoration Program and Schindler Creek
Nevada	Friends of Deer Creek	John van der Veen	Restoring Deer Creek: Overcoming the Legacy of the Gold Mine Era
Alameda	Friends of Codornices Creek	Juliet Lamont	Codornices Creek Watershed Restoration Action Plan
Alameda	Friends of Sausal Creek	Charlotte Bells	Upper Sausal Creek Channel Restoration Program
Contra Costa	Delta Science Center	Steve Barbata	Marsh Creek and Dutch Slough Projects
Contra Costa	Urban Creeks Council/NHI	Rich Walkling	Rheem Creek Restoration Project

In addition to the potential project partners listed above, NHI will work with both the University of California at Berkeley (UCB), and 4 Fox Consultants to undertake this project (please see qualifications in Part H of this proposal). 4 Fox Consultants has significant expertise in data management particularly in relation to evaluating effects of management actions or environmental factors in the face of temporal and/or spatial variation. Several individuals at UCB College of Natural Resources have expertise in participatory processes associated with natural resource management in rural communities.

General Context. Adaptive management is defined as the process of refining and redefining management actions as the restoration process unfolds and monitoring results are obtained and analyzed. It begins with a set of management objectives and involves a feedback loop between management actions and the effect of each action on the system. It is an iterative process, based on a scientific paradigm that treats management actions as experiments subject to modification, rather than as fixed and final decisions, and uses them to develop an enhanced scientific understanding about whether or not, and how, the ecosystem responds to scientific management actions. A comprehensive and integrated adaptive management approach involves the following steps:

1) *Define measurable **goals and objectives**,*
2) *Develop a **conceptual model** that synthesizes existing knowledge and theories, and identifies and describes the key attributes of the system, the inter-relations among them, and the important environmental factors (including stressors) that influence them,*
3) *Generate **hypotheses** about what management actions are necessary to achieve objectives and incorporate these hypotheses into the conceptual model,*
4) *Explicitly disclose **assumptions and uncertainties** regarding how the biophysical system*

will respond to these hypothetical management interventions,

5) *Test and refine the conceptual model with a* ***numerical model(s)*** *if applicable,*
6) *Design* ***management interventions*** *to help distinguish among alternative hypotheses and achieve goals and objectives,*
7) ***Implement*** *interventions, pilot or demonstration projects, targeted research, or some combination of these,*
8) ***Monitor and analyze*** *results using Bayesian statistical techniques to judge progress and update probabilities among competing hypotheses, and adjust models to reflect analyzed results,*
9) ***Adjust*** *management interventions according to results of monitoring, and*
10) ***Design*** *new interventions based on improved understanding.*

When adaptive management first reached the scientific literature over twenty years ago[2], it sparked widespread interest because it tackled several coincident trends, including the perceived failure of traditional approaches to natural resource management,[3] the unraveling of the equilibrium paradigm of nature and its replacement with a complex, stochastic non-equilibrium paradigm, and growing acceptance of participatory or stakeholder driven methods of resource planning.

Adaptive management arose out of this challenging milieu where natural systems are viewed as not only more complex and complicated than previously envisioned, but also their associated problems are considered novel and challenging and have no single right or wrong answer. Under the adaptive management approach, management is no longer a series of discrete, final decisions, but rather an on-going experiment in which management strategies change in response to new information. By acknowledging incomplete understanding of cause-and-effect relationships among management actions, ecological processes, and resource conditions, adaptive management addresses the concept of uncertainty.

In addition, this management science approach is embedded within a collaborative learning process; people and political processes are central features of adaptive management.[4] In the past, public involvement usually meant a linear form of communication, such as newsletters or meetings that provided a one-way flow of information.[5] This process was called an illusion of public involvement and was criticized for the "three I's": **I**nform the Locals, Solicit their **I**nput, then **I**gnore Them.[6]

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[2] Hollings, C.S. 1978. *Adaptive Environmental Assessment and Management.* John Wiley. London, England, and Walthers, C.J. 1986. *Adaptive Management of Renewable Resources*.The Blackburn Press. Caldwell, NJ.

[3] See Hutchings, J.A., C. Walters, and R.L. Haedrich. 1997. Is Scientific Inquiry Incompatible with Government Information Control? Can. J. Fish. Aquatic Sci. 54:1198-1210, and Yaffee, S.L. 1997. Why environmental policy nightmares occur. Conservation Biology 11: 328-337.

[4] Schindler, B. and K.A.Cheek. 1999. Integrating citizens in adaptive management: a prepositional analysis. Conservation Ecology 3(1):9.

[5] Knopp, T.B. and E.S. Caldbeck 1990. The role of participatory democracy in forest management. Journal of Forestry 88(5):13-18.

[6] Schindler, B. 1997. Citizen values and participation in the Tongass National Forest debate. Pages 165-172 in B. Steel, editor, Public lands management in the west.Praeger Press, Westport, Connecticut, USA

Adaptive management, with its stakeholder-manager collaborative learning focus, has been called an unorthodox approach for people who think of management in terms of control.[7] In fact, when attempting to implement an adaptive management program, agencies and other stakeholders must be willing to accept failure as part of the learning process; "experiments often bring surprises, but if resource management is recognized to be inherently uncertain, the surprises become opportunities to learn, rather than failures to predict."[8]

Over the past 20 years resource managers around the globe have been working to take the concept of adaptive management and translate it into a practical, on-the-ground resource management tool. Perhaps the most obvious application of adaptive management is in the discipline of ecological restoration where uncertainty abounds. As such, the concept of adaptive management provides the fundamental underpinnings of large-scale ecosystem restoration projects such as the Everglades, Columbia River Basin, the Colorado River, the Baltic Sea, and the boreal forests of eastern Canada.

Project Approach. This project will look at potential pathways for scaling-down the adaptive management model presented above to better address the particular constraints of smaller-scale projects with limited financial and institutional capacities. For example, Figure 1 illustrates two main approaches to fit adaptive management to smaller scales. The first involves trimming individual components of the adaptive management process so that it is more practical for small-scale implementors. The second involves coordinating smaller efforts into a larger one. Although developing a draft approach for scaling back adaptive management will be one of the first tasks in the project scope, we have outlined some of our initial thinking on this topic to illustrate some of the options that we will evaluate.

- **Scaling back adaptive management-** There are many components of adaptive management (defining measurable goals and objectives, developing a conceptual model, generating hypotheses, etc). We will consider which of these, if any, might be trimmed to deal with smaller-scale systems or systems with constraints. For example, scaling goals and objectives to fit the physical, institutional, and financial scale of the management program will help scale all other steps in the adaptive management process appropriately. Goals and objectives will help determine the scale and the detail of the conceptual models, the types of management interventions, and the scope of the monitoring. Goals and objectives should be physically, intellectually and financially attainable by the implementing managers and management agency.

  In terms of conceptual models, we hypothesize that the actual creation of conceptual models should not be scaled back relative to other steps in the adaptive management process. The value of a well-conceived conceptual model is worth the relatively minor investment of time and finances; it is a powerful tool for illustrating key relationships within systems, for identifying gaps in understanding, and in providing a foundation for a better and shared understanding of the system. In the long-term a well thought out conceptual model can save time by identifying key or controlling variables.

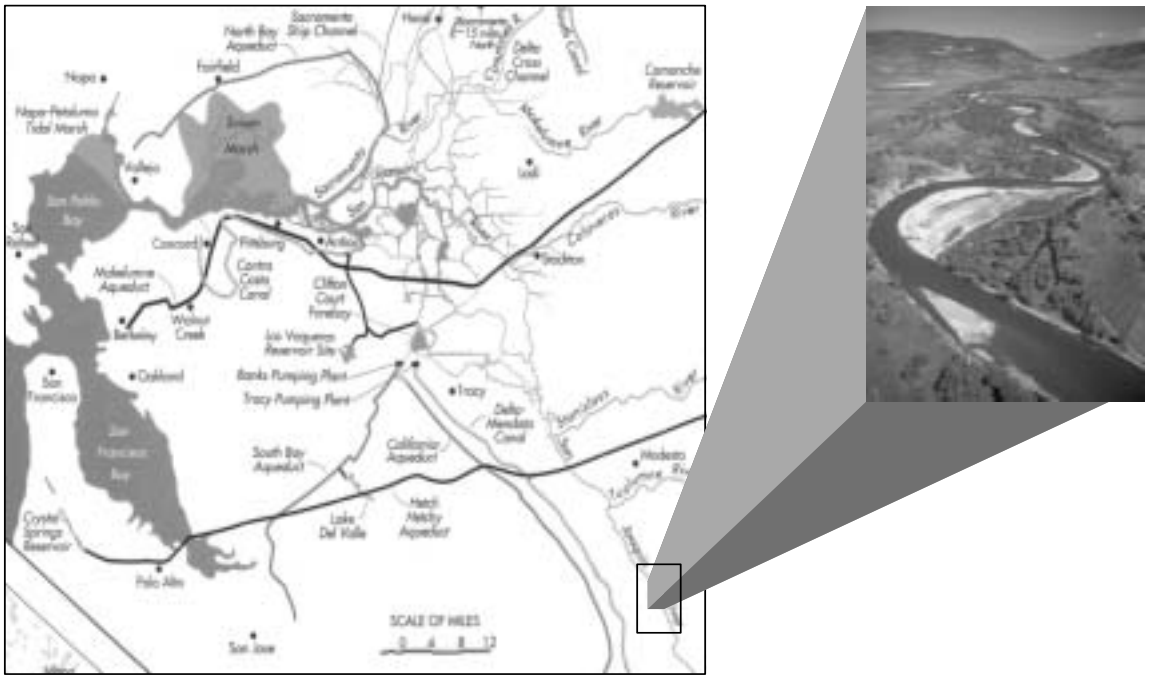
[7] Lee, K.N. 1999. Appraising adaptive management. Conservation Ecology 3(2):3.
[8] Lee, K.N. 1993. *Compass and Gyroscope: Integrating Science and Politics for the Environment*. Island Press, Washington, DC.

Figure 1

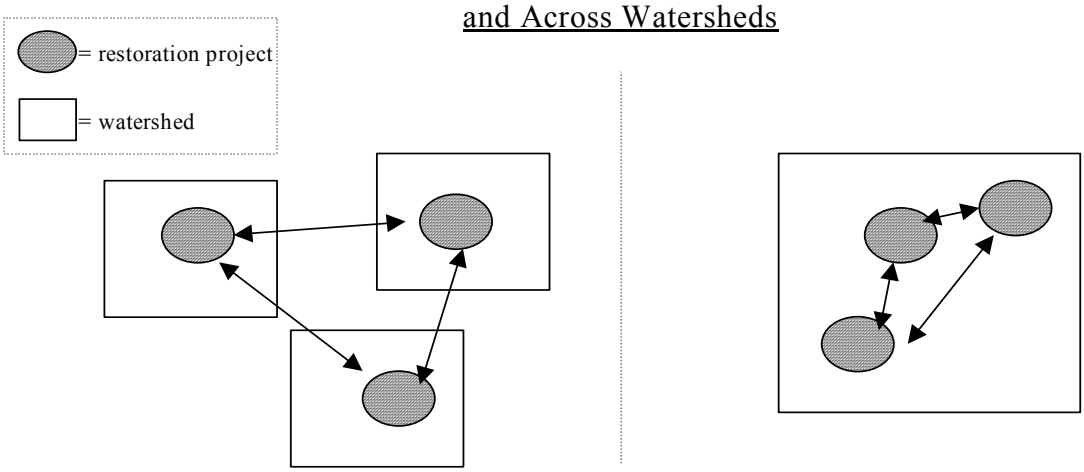
Scaling-down Adaptive Management to Fit Smaller-scale Restoration Projects

Adaptive Management Applied to Large-Scale Ecosystem Restoration

Adaptive Management Applied to Smaller-Scale Ecosystem Restoration



Facilitating Coordination and Communication Between Projects within the Same Watershed and Across Watersheds



In terms of monitoring, choosing wisely among the limitless possibilities of what to monitor will greatly increase the efficacy and reduce the cost of adaptive management. Scaled back monitoring may focus on only the most important or most indicative species or parameters.

Regarding community participation, the idea of collaborative learning is fundamental to adaptive management. Therefore, a participatory element is essential even when addressing small-scale problems. Community participation can take many forms ranging from basic citizen monitoring programs to full-scale, community-based Coordinated Resource Management and Planning (CRMP). Community participation can also offer a level of assurance that needed long-term operation and/or maintenance of any restoration project will be physically and financially supported by the local community.

- **Coordination and linking of projects-** Another response to addressing the constraints to small-scale projects is to link numerous independent operations into a larger-scale approach. It is important for managers to understand that their small-scale system does not exist in a vacuum; it is adjacent to, nested in, or otherwise related to myriad other systems. Many of these systems experience similar challenges, must address the same uncertainties, and are currently involved in some related management activity. *By stepping back and taking a macro-scale perspective on management of smaller systems, managers can reduce cost and realize learning benefits by coordinating with activities elsewhere.* With this approach, these smaller projects can become key building blocks towards larger ecosystem understanding. By coordinating with other activities, managers can share resources, distribute costs, and realize economies of scale. Perhaps more important, managers will have access to data that address similar problems in similar situations. The savings realized in sharing resources, increasing learning, and avoiding duplicate experiments across the systems, covers the small, added cost of coordination between the systems.

Relation to CALFED Goals and Objectives. The CALFED Bay-Delta Program views the application of adaptive management as essential to meeting the long-term goals and objectives of the program. Adaptive management is such an integral component of the CALFED Program that it is the first of 11 implementation principles outlined in the Program's Implementation Memorandum of Understanding:

> "The CALFED Agencies will implement the CALFED Program using a science-based adaptive management approach. This approach will rely on constant monitoring and evaluation of actions in all Program elements."[9]

This recognition of the importance of successfully implementing adaptive management places a high premium on the ability of project proponents to develop rigorous monitoring protocols, gather high quality data, and ensure that the results of data analysis are used to refine management interventions. The Small is Beautiful project will provide direct support to communities and watershed groups that are working to develop and implement their adaptive management programs.

[9] CALFED ERP-Draft Implementation Plan, August 6, 2001

The different elements of this project address many of the CALFED Bay-Delta Program Goals and CALFED Watershed Program Initial Priorities, Primary Objectives, and Program Principles. In order to adequately address the question of how specifically this proposal addresses these various priorities, etc, we prepared a matrix (Table 2) that outlines the steps that this project takes towards furthering CALFED's goals and objectives.

In addition, the Small is Beautiful meets the **CALFED Watershed Program Principles**: the Project supports community-based efforts to manage watersheds, involves the development and use of monitoring protocols, increases learning and awareness among civil society in the watershed through the promotion of collaborative learning, as well as among other watershed collaborators. In addition, through fund raising efforts, the project provides for ongoing implementation. Lastly, the Small is Beautiful project meets the **CALFED Bay-Delta Program Implementation Commitments** in that it increases the capacity of local leaders and decision-makers to understand and make science-based decisions using an effective adaptive management approach in their watershed.

Table 2: Relation to CALFED Goals and Objectives

CALFED BAY-DELTA PROGRAM GOALS
1. Provide good water quality for all beneficial uses Indirect benefit provided by project activities in that developing and implementing an effective adaptive management plan is central to managing projects for good water quality.
2. Improve and increase aquatic and terrestrial habitats and improve ecological functions in the Bay-Delta Indirect benefit provided by project activities in that developing and implementing an effective adaptive management plan is central to improving aquatic and terrestrial habitats.
3. Reduce the mismatch between Bay-Delta water supplies and current and projected beneficial uses NA
4. Reduce the risk from catastrophic breaching of Delta levees NA
CALFED ERP STRATEGIC GOALS & OBJECTIVES
1. Recovery of at-risk species and native biotic communities Indirect benefit provided by project activities in that developing and implementing an effective adaptive management plan is central to recovery of at-risk species and native biotic communities.
2. Rehabilitate ecological process in the Bay-Delta estuary and its watershed Indirect benefit provided by project activities in that developing and implementing an adaptive management plan will help communities identify the key ecological processes in their watershed and manage more effectively to restore these processes.
3. Maintain or enhance populations of harvest species NA
4. Protect and restore functional habitat types in the Bay-Delta estuary and its watershed Indirect benefit provided by project activities in that developing and implementing an adaptive management plan will assist restoration and management efforts in being more effective in terms of reaching their project goals.
5. Prevent the establishment of additional non-native invasive species Indirect benefit provided by project activities.
6. Improve and/or maintain water and sediment quality conditions that support healthy and diverse aquatic ecosystems Indirect benefit provided by project activities.

WATERSHED PROGRAM INITIAL PRIORITIES
1. Build community capacity to assess and effectively manage watersheds that affect the Bay-Delta system This project aims to assist financial hardship, small rural and urban communities across the CALFED solution area with the development of appropriate adaptive management plans for their riverine and riparian restoration activities. We will select 5-6 pilot projects within the CALFED solution area to focus our work. For each pilot project we will provide on-the-ground technical support for the development or application of existing adaptive management plans. The on-the-ground component of this proposed project will focus on distillation of the key issues facing each community or project and the development of appropriate strategies for addressing each issue. In practical terms, this might mean assistance with development of project goals, measurable objectives and conceptual models, monitoring protocols and design, interpretation of data, strategies to implement interventions, and facilitation of information sharing and coordination with similar projects elsewhere in the state. This assistance will directly build community capacity to assess and effectively manage the watersheds that affect the Bay-Delta System.
2. Develop watershed assessments and management plans Adaptive management plans are key elements of watershed assessments and management plans. There is a gap in the capacity of watershed management groups in the CALFED solution area, particularly rural and urban financially disadvantaged communities, to both understand the adaptive management process and to develop effective adaptive management strategies that fit their smaller-scale process. This project takes significant steps towards filling that gap.
3. Implement specific watershed conservation, maintenance and restoration actions identified in existing watershed plans Although this project will not directly implement specific elements in already identified watershed plans, it will assist communities in using the adaptive management tools (conceptual models and perhaps numerical models) to differentiate among a range of priority management actions, and then to implement these actions in a way that allows for both conservation value and for learning about the system.
WATERSHED PROGRAM PRIMARY OBJECTIVES
Facilitate coordination and collaboration among government agencies, other organizations, and local watershed groups (A4. Describe mechanisms to facilitate technical assistance from government agencies, and others to local watershed programs, A5. Improve collaboration between existing and future programs to achieve mutual watershed management objectives) This project will facilitate a mechanism to provide technical assistance from NHI and UCB to community-based watershed management efforts that are charged with developing and implementing adaptive management plans. In addition, this effort will explore mechanisms to improve collaboration and sharing of experiences among practitioners of adaptive management.
B. Develop watershed monitoring and assessment protocols (B1. Define performance measurements that ensure adaptive management processes can be applied at multiple scales and across ownership, B2. Assist CMARP in the development of watershed monitoring protocols, B3. Facilitate monitoring efforts that are consistent with CMARP's protocols) This project supports the CALFED Watershed Program because it seeks to address an existing and recognized obstacle to the implementation of the CALFED Program — the application of adaptive management in small-scale projects with limited financial and institutional capacity. This project is unique in its regional perspective and has been designed to both facilitate incorporation of a broad array of experiences and ensure the applicability of the final model to a wide array of situations.

C. Support education and outreach (C1. Provide support to existing and future watershed programs, C3. Sponsor general stakeholder workshops to allow exchange of information on local watershed programs success and failure, C4. Improve the use and usefulness of existing and future resource information centers to assist watershed groups in conducting watershed activities)

This project will facilitate a mechanism to provide technical assistance from NHI and UCB to community-based watershed management efforts that are charged with developing and implementing adaptive management plans. In addition, this effort will explore mechanisms to improve collaboration and sharing of experiences among practitioners of adaptive management. Further, three workshops will be arranged to provide a face-to-face venue for information exchange. This project will also seek to find and use existing resource information centers to convey this information on adaptive management, including trainings and existing databases.

D. Integrate Watershed Program and other CALFED program elements

This project will explore the possibility of "scaling up" smaller watershed management efforts within an adaptive management context so that efforts are linked together for a larger impact, or individual efforts are linked to other CALFED program elements.

E3. Identify examples of watershed activities that improve the basic biological and physical functions and processes of a watershed

Indirect benefit provided by project activities in that developing and implementing an adaptive management plan will help communities identify the key ecological processes in their watershed and manage more effectively to restore these processes.

F. Implement a strategy that will ensure support and long-term sustainability of local watershed activities.

This activity is aimed at providing communities with the necessary assistance to develop robust adaptive management plans that are trimmed to serve their needs.

WATERSHED PROGRAM DESIRED OUTCOMES

1. Coordination and Assistance

This project will facilitate a mechanism to provide technical assistance from NHI and UCB to community-based watershed management efforts that are charged with developing and implementing adaptive management plans. In addition, this effort will explore mechanisms to improve collaboration and sharing of experiences among practitioners of adaptive management.

2. Development of Monitoring Protocols and Application of Adaptive Management Process

This project aims to assist financial hardship, small rural and urban communities across the CALFED solution area with the development of appropriate adaptive management plans for their riverine and riparian restoration activities. We will select 5-6 pilot projects within the CALFED solution area to focus our work. For each pilot project we will provide on-the-ground technical support for the development or application of existing adaptive management plans. The on-the-ground component of this proposed project will focus on distillation of the key issues facing each community or project and the development of appropriate strategies for addressing each issue. In practical terms, this might mean assistance with development of project goals, measurable objectives and conceptual models, monitoring protocols and design, interpretation of data, strategies to implement interventions, and facilitation of information sharing and coordination with similar projects elsewhere in the state. In addition, this project will then leverage that experience into a Primer for Applying Adaptive Management in Smaller-Scale Restoration Projects – this document will be widely distributed and updated over time.

3. Improve and Expand Watershed Education and Public Outreach (3.1 Informed citizenry, 3.2 Sustainable watershed programs)

One of the central tenets of adaptive management is collaborative learning. This project will explore scale-specific processes and institutional arrangements for ensuring broad collaborative learning. Building community knowledge of a watershed leads to improved stewardship.

4. Maximization of the Multiple Benefits of Common Programs

This project seeks to identify common issues plaguing adaptive management implementers and work towards common solutions.

5. Improved Watershed Stewardship (5.1 Improved watershed ecosystem maintenance and enhancement, 5.2 Improved Watershed Planning and Management)
One of the central tenets of adaptive management is collaborative learning. This project will explore scale-specific processes and institutional arrangements for ensuring broad collaborative learning. Building community knowledge of a watershed leads to improved stewardship.

Expected Results. This project has been designed to directly address the existing limitations or gaps in knowledge regarding the application of adaptive management to small-scale restoration initiatives. The expected outcomes of this project are listed below:

- ✓ **Increase the number of CALFED supported projects that produce significant direct scientific connections between implementation and physical effects in the watershed-** Monitoring protocols can be designed to not only evaluate and modify the management actions relative to a management objective, but also have an experimental component that helps practitioners differentiate among competing scientific hypotheses. Thus, the adaptive management espoused in this proposal looks for opportunities to simultaneously meet short-term management objectives while learning about the system.

- ✓ **Increase community involvement in the management of local resources-** Adaptive management, as described in this proposal, embraces stakeholder participation and attempts to understand the potential trade-offs among stakeholder groups under different management scenarios through generating innovative, win-win solutions when possible. Because the idea of collaborative learning is fundamental to adaptive management, a participatory element is particularly essential when addressing small-scale, local problems. In addition, this project seeks to develop a model for applying adaptive management to small-scale restoration projects. This model will be founded on participatory, stakeholder driven decision making and citizen-based resource monitoring.

- ✓ **Increase the likelihood that projects will meet their management goals-** This project will raise community-level managers capacity to monitor the impact of their management/restoration actions and adjust them appropriately to better meet their goals.

- ✓ **Increase the level of confidence in scientific data generated through citizen-based monitoring in the adaptive management process-** By providing on-the-ground technical support we can facilitate the development of scale and objective appropriate monitoring. Moreover, this monitoring will be developed to meet CMARP accepted standards for data collection and analysis and include rigorous QAQC protocols. As the monitoring components of each adaptive management plan become more scientifically rigorous, the level of confidence in those data will increase. Good science, in turn, will provide the necessary information, confidence, and support for scientifically defensible decision-making at local levels.

- ✓ **Reduce the cost associated with long-term project management and, in particular, adaptive management-** NHI's preliminary research indicates that by linking similar projects within and across watersheds, managers can capitalize on economies of scale via coordinated information sharing, technology transfers, and lessons learned. In addition, developing an educated and integrated citizenry can greatly reduce the burdensome costs

of regular field monitoring by replacing paid scientists with interested volunteers. Reducing costs will increase the level of assurance that needed long term operation and/or maintenance of the projects or programs will be accomplished, and that much of the long term effort will be supported by community volunteers and community-based funding.

- ✓ **Increase coordination and learning across restoration projects**- It is a primary goal and expected outcome of this project to increase the number of active partnerships working to execute the CALFED Program. The success of small-scale adaptive management is predicated on coordination and information sharing between projects and project proponents. As the importance of coordination becomes clearer to local groups, so does the need for standardized data collection protocols. It is our belief that this project can play an important role in helping ensure that a greater percentage of monitoring data generated from small-scale projects is useful for cross-watershed comparisons and robust enough to be of interest at a regional and/or state level.

- ✓ **Ensure technology/information transfer-** In addition to this direct assistance at a community level, this project will leverage the experiences and "lessons learned" from the pilot projects into a draft model for how to apply adaptive management to smaller-scale systems which can refined over time and implemented widely. This model will be widely available on NHI's website and will be directly disseminated through CALFED and its associated agencies. Through this project, NHI will become a clearinghouse for information on applying adaptive management to small-scale systems.

PART C – PROPOSED SCOPE OF WORK

1. BACKGROUND AND GOALS

This project aims to assist financial hardship, small rural and urban communities with the development of appropriate adaptive management plans that support their riverine and riparian restoration activities and contribute to an overall understanding of river function and restoration. In addition to this direct assistance to on-the-ground activities at a community level, this project will leverage that experience into a draft model for how to apply adaptive management to smaller-scale systems which can refined over time. This experience and information will be distributed and publicized widely.

The overall goal of Small is Beautiful: Scaling Adaptive Management to Fit a Range of Riverine Systems (Small is Beautiful) is to operationalize the concept of adaptive management to support small-scale restoration and watershed management efforts. **Specific objectives** include the following:

- To identify and develop pilot projects in 5-6 small rural and urban hardship communities and assist in the application of adaptive management to restoration projects;
- To develop and widely disseminate a Primer for Applying Adaptive Management in Smaller-Scale Restoration Projects based on literature review and experience with pilot projects;
- To effectively apply adaptive management to small-scale systems to generate meaningful and transferable information about river function and restoration.

2. PROPOSED WORK TO BE PERFORMED

Task 2: Draft Approach for the Application of Adaptive Management to Smaller-Scale Watershed Initiatives. This component of the project is aimed at exploring in a conceptual way the various options available for implementing small-scale restoration projects. This conceptual model will consider questions and approaches such as:

1) Should small adaptive management experiments focus on a general class of problems that occur across similar small-scale systems, rather than on a specific problem at a single site?
2) Or should information at a reach or sub-basin level be scaled-up so that it fits within larger questions at a basin-level?
3) What types of institutional and participatory arrangements are necessary at a local level and at a larger scale to coordinate with other restoration efforts so that information is collected and translated into knowledge in the most effective way?
4) What components of adaptive management (conceptual model, factors manipulated, monitoring program, etc.) can and should be scaled down to accommodate limited resources and capacity?
5) Should a passive adaptive management approach be promoted for small-scale activities over the more scientifically-driven active adaptive management approach?

This element of the project will address such issues and develop a draft approach of appropriate ways to downsize adaptive management to smaller watershed restoration activities with limited resources. This "conceptual model" of applying adaptive management to smaller-scale systems will be refined over the life of the project as more experience is gained.

2.1: Review both Published and Grey Literature. This subtask will involve a thorough literature review to determine what lessons learned in large scale adaptive management could be applied to these smaller-scale systems. In addition, literature from a range of disciplines (including forestry and wildlife) will be scanned for additional relevant information.

2.2: Contact and Interview Practitioners. This subtask will involve contacting and interviewing practitioners that are in the process of implementing small-scale adaptive management projects, but have not written up any of their experiences. These interviews will provide on-the-ground input for drafting appropriate methods and approaches.

2.3: Develop Draft Conceptual Model. This subtask will involve synthesizing the information gleaned in the previous two subtasks into a draft conceptual model of approaches to scale adaptive management to fit smaller-scale systems. Each component of the adaptive management process will be analyzed, as well as the overall process for cost-effective and efficient means to downsize. In addition, elements that are essential to the process will be highlighted. Methods to coordinate management interventions within and across watersheds will be evaluated.

2.4: **Distribute Draft Conceptual Model for Review.** Project proponents will identify 5-10 experts and practitioners in the field of adaptive management to review and comment on the proposal.

2.5: Finalize Draft Model and Distribute. Comments will be incorporated into a final draft that will then be distributed over the Internet and via conventional means for a broad range of input. This document will be a "working draft" that will be modified throughout the life of the project and thereafter as more experience and information is gained.

Task Deliverables:

2.1 Annotated bibliography of literature relevant to small-scale watershed management and restoration activities.
2.5 Final draft of adaptive management approaches to small-scale systems.

Success Criteria: Increased knowledge of potential approaches to applying adaptive management to small-scale systems
Metric: Draft document generates significant interest via Internet and conventional comment lines

Task 3: Assistance to Small Communities. This aspect of the project will be aimed at providing direct assistance to financial hardship, small rural and urban communities as they move to implement adaptive management plans as part of their restoration activities. It will begin with a survey of planned and on-going activities throughout the CALFED solution area, followed by the

development of working relationships with 5-6 pilot communities. Criteria to be used in pilot project selection include: 1) financial hardship, 2) readiness to proceed, and 3) an existing monitoring program preferably operating under an approved QAPP. We will also consider several pilot projects in the same watershed or sub-basin or separate watershed projects, but addressing similar issues. In this way, we can begin to look at opportunities for coordination and "scaling-up" smaller, discrete projects into a larger adaptive management context.

Once the pilot communities have been identified, on-the-ground assistance will be focused on distillation of the key issues facing each community or project and the development of appropriate strategies for addressing each issue. In practical terms, this might mean assistance with development of project goals, measurable objectives, and conceptual models, monitoring protocols and design, interpretation of data, strategies to implement interventions, and facilitation of information sharing and coordination with similar projects elsewhere in the state.

3.1: Survey of Planned and On-going Activities. This project is a regional project and as such, pilot projects will be located in rural and urban hardship communities and counties thorough the CALFED Bay-Delta solution area. Over the last year, NHI staff have begun the process of identifying, contacting and screening potential pilot projects. We have interviewed a number of project managers working for local organizations or agencies on small-scale restoration initiatives in the CALFED solution area, many with projects currently funded by CALFED. This subtask will continue that process using the criteria outlined above.

3.2: Development of Pilot Projects. This subtask will form the bulk of the activity under this project; it will involve on-going assistance for two years to the 5-6 communities involved in this process.

3.3: Articulate Lessons-Learned. This subtask will involve on-going evaluations of lessons-learned in the application of adaptive management to these smaller-scale systems.

3.4: Convene Workshops. A workshop will be convened towards the beginning of the project and then halfway through it to bring together the participants working on the pilot projects. In this way, we will begin to develop communication lines among a core set of practitioners. Other interested individuals or organizations will also be invited to attend these workshops. These workshops will be an opportunity to re-evaluate our conceptual model of adaptive management applied to small-scale systems and to share ideas and identify obstacles.

Task Deliverables:

3.1 Summary sheet for each pilot community/project. The summary sheet will include relevant information on existing institutional capacity, strength and standing of partnerships, project goals and objectives, funding sources, extent and type of citizen participation, particular opportunities and constraints, any tangible products from our assistance (i.e. conceptual model, monitoring plan, etc.), and "lessons learned".

3.1 Listing of pilot project and any other associated projects on the Natural Resources Projects Inventory (NRPI) website.

3.4 Two workshops convened among pilot project participants.

Success Criteria: Communities with assistance from the project make significant progress in designing and implementing their adaptive management plans
Metric: Pre- and post-evaluations of the adaptive management planning in the pilot projects reveal significant progress

Task 4: Primer for Applying Adaptive Management in Smaller-Scale Restoration Projects. The intent of this task is to consolidate the on-going responses to the draft conceptual model, with experiences with the on-the-ground pilot projects into a Primer for Applying Adaptive Management in Smaller-Scale Restoration Projects. This Primer will be presented in a final project workshop to a wide range of practitioners. It will also be widely distributed electronically and in hard copy.

4.1: Analysis of Lessons Learned. This subtask will involve a final analysis of the lessons-learned from the pilot projects.

4.2: Drafting and Dissemination of Primer. This subtask will involve drafting the Primer described above, having it reviewed and finalized. Significant efforts will be made to widely publicize the availability of the Primer, including organizing a final project workshop with the intent of articulating the lessons-learned in this project and providing a forum for practitioners to interact.

4.3: Project Development. Project partners will make significant efforts to raise additional funds during the life of the project to provide assistance to small communities on an on-going basis through a clearinghouse type mechanism.

Task Deliverables:
4.1 Completed Primer for Applying Adaptive Management in Smaller-Scale Restoration Projects.
4.2 Final project workshop.

Success Criteria: Appropriate methods for applying adaptive management to smaller-scale systems are adopted widely within the CALFED solution area
Metric: Significant demand for on-going clearinghouse at NHI on this subject

3. TARGET COMPLETION DATES

Task No. Deliverables	Target Completion Dates
Task 1: Project Administration	
1.2 Quarterly Progress Reports	10/10/03, 1/10/04, 4/10/04, 7/10/04, 10/10/04, 1/10/05, 4/10/05, 7/10/05, 10/10/05, 1/10/06, 4/10/06
1.5 Contract Summary Form	10/1/03
1.6 List of subcontracted tasks: Good Faith Effort documents: Quarterly Utilization Reports:	12/1/03 12/1/03 10/10/03, 1/10/04, 4/10/04, 7/10/04, 10/10/04, 1/10/05, 4/10/05, 7/10/05, 10/10/05, 1/10/06, 4/10/06
1.7 Subcontractor Documentation	11/1/03
1.8 Expenditure/Invoice Projections	10/10/03, 1/10/04, 4/10/04, 7/10/04, 10/10/04, 1/10/05, 4/10/05, 7/10/05, 10/10/05, 1/10/06, 4/10/06
1.9 Project Survey Form	4/1/06
Task 2: Draft Approach	
2.1 Annotated bibliography	2/1/04
2.5 Final draft of Adaptive Management Approaches	6/1/04
Task 3: Assistance to Small Communities	
3.1. Summary Sheet for Each Pilot Community/Project	2/1/04
3.1 Listing of pilot projects on the NRPI website	3/1/04
3.4 Two workshops convened among pilot project participants	5/1/04, 11/1/05
Task 4: Primer for Small Communities	
4.3 Completed Primer for Small Communities	4/1/06
4.3 Final Project Workshop	5/1/06
Task 5: Draft and Final Reports	
#.1 Draft Report	4/1/06
#.2 Final Report	6/1/06

PART D1 - BUDGET SUMMARY SHEET – TASK BUDGET BREAKDOWN

	Proposition 13 Funds	Other Project Funds	Total Budget
1. Task 1 – Project Administration	$18,000	$10,000	$28,000
2. Task 2 – Draft Approach	$18,000	$10,000	$28,000
3. Task 3 – Ass. To Small Comm.	$92,000	$10,000	$102,000
4. Task 4 – Primer	$45,000	$10,000	$55,000
5. Task 5 – Draft and Final Reports	$10,500		$10,500
TOTAL BUDGET	$183,500	$40,000	$223,500

PART D2 - BUDGET SUMMARY SHEET – LINE ITEM Budget

	Proposition 13 Funds	Other Project Funds	Total Budget
1. Personnel Services	$93,000	$25,000	$118,000
2. Operating Expenses	$5,625	$5,000	$10,625
3. Property Acquisitions			
a. Equipment	$4,000		$4,000
b. Furniture			
c. Portable assets			
d. Electronic data software/hardware	$5,000		$5,000
e. Processing equipment			
f. Miscellaneous	$2,000		$2,000
4. Professional and Consultant Services	$28,000		$28,000
5. Contract Laboratory Services			
6. Construction Expenses			
7. General Overhead	$45,875	$10,000	$55,875
TOTAL BUDGET	$183,500	$40,000*	$223,500

* Natural Heritage Institute has secured $30,000 from the Switzer Foundation and $10,000 from the Hewlett Foundation in support of this work

PART E – PROJECT MAP

PART F – ENVIRONMENTAL INFORMATION FORM (3 pages maximum)

ENVIRONMENTAL INFORMATION FORM

NEPA/CEQA

1. Will this project require compliance with CEQA, NEPA, or both? Yes_____No_**X**____

2. If you checked "no" to question 1, please explain why compliance is not required for the actions in this proposal. **There are no physical actions proposed in this proposal**

3. If the project will require CEQA and/or NEPA compliance, identify the lead agency(ies).

   CEQA Lead Agency _____

   NEPA Lead Agency _____

4. Please check which type of document will be prepared.

CEQA		**NEPA**	
Categorical Exemption	_____	Categorical Exclusion	_____
Initial Study	_____	Environmental Assessment/FONSI	_____
Environmental Impact Report	_____	Environment Impact Statement	_____

   If you anticipate relying on either or both the Categorical Exemption or Categorical Exclusion for this project, please specifically identify the exemption and/or exclusion that covers this project. (Example: Fish and Wildlife Service Manual at 516 DM 6 Appendix 1.4 Categorical Exclusions Section B Resources Management: (1) Research, inventory, and information collection activities directly related to the conservation of fish and wildlife resources.)

5. If the CEQA/NEPA process is not complete, please describe the estimated timelines and cost for the process and the expected date of completion.

6. If the CEQA/NEPA document has been completed:

   What is the name of the document?_____

   Please attach a copy of the CEQA/NEPA document cover page to the application.

Please indicate what permits or other approvals may be required for the activities contained in your proposal and which have already been obtained. Please check all that apply.

LOCAL PERMITS AND APPROVALS*	Needed?	Obtained?
Conditional use permit		
Variance		
Subdivision Map Act		
Grading permit		
General plan or Local Coastal Program amendment		
Specific plan approval		
Rezone		
Williamson Act Contract cancellation		
Local Coastal Development Permit		
Other		
STATE PERMITS AND APPROVALS*	Needed?	Obtained?
Scientific collecting permit		
CESA compliance: 2081		
CESA compliance: NCCP		
1601/03		
CWA 401 certification		
Coastal development permit		
Reclamation Board approval		
Notification of DPC or BCDC		
Other		
FEDERAL PERMITS AND APPROVALS*	Needed?	Obtained?
ESA compliance Section 7 consultation		
ESA compliance Section 10 permit		
Rivers and Harbors Act		
CWA 404		

Other		
PERMISSION TO ACCESS PROPERTY*		
Permission to access city, county or other local agency land. If "yes," indicate the name of the agency: _____		
Permission to access State land. If "yes," indicate the name of the agency: _____		
Permission to access federal land. If "yes," indicate the name of the agency: _____		
Permission to access private land. If "yes," indicate the name of the landowner (if multiple landowners, indicate how many individuals will be involved and what percentage have already granted permission: _____		

***Any and all on-the-ground activities will be carried out under the auspices of local agencies or organization. We will not choose any pilot project in which the project sponsors have not acquired all necessary permissions/permits from appropriate landowners.**

PART G – LAND USE QUESTIONNAIRE (2 pages maximum)

PART G - LAND USE QUESTIONNAIRE

1. Do the actions in the proposal involve construction or physical changes in the land use?
   Yes____ No__**X**__

If you answered "yes" to # 1, describe what actions will occur on the land involved in the proposal.

If you answered "no" to # 1, explain what type of actions are involved in the proposal (i.e., research only, planning only). **Planning, research, and technical oversight re: applying adaptive management**

2. How many acres of land will be subject to a land use change under the proposal? ___**0**____

3. What is the current land use of the area subject to a land use change under the proposal? What is the current zoning and general plan designation(s) for the property? Does the current land use involve agricultural production? **NA**

   a) Current land use _____
   b) Current zoning _____
   c) Current general plan designation _____
   d) Does current use involve agricultural production? Yes____ No____

4. Is the land subject to a land use change in the proposal currently under a Williamson Act contract?
   Yes____ No __**X**___

5. What is the proposed land use of the area subject to a land use change under the proposal?

6. Will the applicant acquire any land under the proposal, either in fee (purchase) or through a conservation easement? Yes_____ No___**X**__

   a) If you answered "yes" to 6, describe the number of acres that will be acquired and whether the acquisition will be of fee title or a conservation easement:
   b) Total number of acres to be acquired under proposal
      _____
   c) Number of acres to be acquired in fee
      _____
   d) Number of acres to be subject to conservation easement
      _____

7. For all lands subject to a land use change under the proposal, describe what entity or organization will manage the property and provide operations and maintenance services.

8. Will the applicant require access across public or private property that the applicant does not own to accomplish the activities in the proposal? Yes_____ No__**X**___

9. For land acquisitions (fee title or easements), will existing water rights be acquired? Yes_____ No_____

10. Does the applicant propose any modifications to the water right or change in the delivery of the water?
    Yes_____ No_**X**___

    If "yes" to 10, please describe the modifications or changes.

PART H – SUPPORTING DOCUMENTATION

I. PROJECT PARTNERS

A. Natural Heritage Institute

The Natural Heritage Institute (NHI) is a nonprofit organization of lawyers, scientists and economists dedicated to improving the laws and institutions that manage natural resources in the United States and globally. Since our founding in 1989, we have been a leader in crafting innovative solutions that are based on scientific investigation and economic and policy analysis. We apply a wide array of tools in pursuit of our mission: we advocate before judicial, administrative and legislative bodies; serve as technical and policy advisors to the ultimate governmental decision makers; plan and implement new resource management programs; design and apply state-of-the-science decision support systems; and represent conservation interests in complex, multi-party negotiations over the allocation of natural resources.

NHI draws on wide-ranging, interdisciplinary expertise from universities, other nonprofits, and consulting firms to augment the skills of its core staff in meeting any resource management challenge, however novel or demanding. Our current project activity includes domestic and international water management, hydropower reform, prevention of arid land degradation and desertification, habitat conservation planning for endangered species, native fisheries restoration through on-the-ground restoration measures, and legal proceedings and negotiations to increase environmental protection for at-risk species. Key accomplishments in each of our program areas are detailed on our website (www.n-h-i.org).

The Natural Heritage Institute (NHI) has a long history of involvement in research on and practical application of adaptive management. Below is a listing of adaptive management related initiatives that NHI staff are currently involved in.

Yolo Bypass Adaptive Management - NHI is currently responsible for project management of the CALFED funded feasibility assessment for flooding of the Yolo Bypass entitled, "Inundation of a Section of the Yolo Bypass to Restore Sacramento Splittail and to Support a Suite of Other Anadromous and Native Species in Dry Years". Although this project is not specifically an adaptive management project, NHI and project partner DWR are currently seeking funds to realize the recommendations of the feasibility analysis. The aquatic habitat restoration measures considered for the Yolo Bypass are oriented towards enhancing native fish populations, especially salmon and splittail, while discouraging exotic species such as centrarchids and carp. The actions being considered will also enhance non-target species by increasing habitat diversity, terrestrial material input, primary production, and invertebrate production. These restoration goals will be embedded within an adaptive management protocol with the intent of reducing specific uncertainties associated with restoration of floodplain habitat for native species. Restoration of the Yolo Bypass under an adaptive management approach promises to provide an early-learning opportunity for application to other restoration sites.

Guadalupe River Flood Control Adaptive Management Team (AMT)- NHI's legal and scientific experts work with resource agency staff and the Santa Clara Valley Water District to develop a comprehensive 100-year adaptive management program to assess the effectiveness of SCVWD's flood control mitigation and ecosystem restoration strategies on the Guadalupe River. In its developmental stages, NHI played a major role in helping developing the goals and institutional framework for the AMT and defining monitoring protocols, measurable objectives and success metrics. Today, NHI scientists representing the interests of the Guadalupe-Coyote RCD and the Pacific Coast Federation of Fishermen's Associations, sit on the AMT and are responsible for analyzing monitoring data, adjusting monitoring protocols, and devising appropriate management interventions when necessary.

CALFED-funded Marsh Creek Watershed Science Program- NHI and the Delta Science Center are currently developing a rigorous high school student based water quality and biotic monitoring plan for watersheds. In the Marsh Creek watershed, we are training students, teachers and interested students in data collection, data analysis, and QAQC procedures. We expect that data derived from this process will form the basis for a long term data gathering effort that will both inform future restoration actions and assist in future adaptive management of local aquatic and riparian resources. The current set of volunteer monitoring protocols was developed in collaboration with Revital Katznelson of the RWQCB and Steve Cochrane of the San Francisco Estuary Project.

Environmental Water Caucus (EWC)- Although this caucus primarily functions as a policy forum, it is also a valuable resource for information dissemination. NHI plans to use its membership in the EWC as one way to ensure that information developed through this proposal is widely distributed and accessible to non-governmental organizations involved in small-scale restoration across the state.

Elizabeth Soderstrom, Ph.D., is a water resource scientist. Dr. Soderstrom's work focuses on applying improved adaptive management approaches to aquatic restoration and river basin management, both nationally and internationally. At present, she has the technical lead role on several activities including planning in the Guadalupe River Basin, the Yolo Bypass, and the Rio Grande. Previously, she served for four years as the lead position in water resources management at USAID's Regional Center for Southern Africa based in Gaborone, Botswana. In this position, Dr. Soderstrom designed and managed water related activities in training, NGO capacity building, legal analysis, watershed management, and policy implementation. She represented the U.S. government's position and interests to national and regional level government agencies, to other donors, and at international meetings. She served as a Steering Committee Member for: 1) the Okavango Delta Ramsar Planning Process, 2) Southern Africa Water Round Table Strategy Implementation, and 3) the Global Water Partnership's Southern Africa Visioning Process. Dr. Soderstrom has received a Switzer Environmental Fellowship, a Switzer Environmental Leadership Grant, and a Science, Engineering and Diplomacy Fellowship from the American Association for the Advancement of Science. She received her B.S. and M.S. in Biological Sciences from Stanford University and her Ph.D. in Wildlands Resource Science from UC Berkeley.

John Cain, M.L.A., is an environmental scientist who specializes in river restoration and water resources management. His recent research focused on historical geomorphic and hydrologic

changes to the San Joaquin River and their implications for fisheries restoration. As a planner with the Nature Conservancy, he developed an aquatic species conservation plan for the San Joaquin Valley. He served as staff scientist for the Mono Lake Committee where he prepared evidence for the Mono Lake water rights hearings and served on the committee overseeing restoration of Rush and Lee Vining Creeks. At NHI, he is currently developing a restoration plan for the Sacramento/San Joaquin Delta. He holds an undergraduate degree in physical geography and a Masters in environmental planning from UC Berkeley.

James Robins, M.S., is a resource scientist who specializes in plant ecology, stream restoration, and invasive species. His research efforts include analysis of the relationship between livestock grazing and both vernal pool biota and hydrology, co-development of a model to predict riparian vegetation potential in dewatered stream reaches, and evaluation of habitat restoration potential via historical ecology. As a graduate student, Mr. Robins was involved in various research projects focused on competition between exotic-invasive flora and native flora. He received his M.S. in Rangeland Ecology from UC Berkeley in 1999 and his B.A. from Vassar College in 1993.

Rich Walkling, M.L.A., is an environmental planner who specializes in water resource management and environmental restoration. He has worked as a GIS analyst for the USEPA and on USAID-funded environmental health projects in Latin America. He has designed restoration plans for alluvial streams in California and for subsided islands in the Sacramento-San Joaquin delta. He recently received a Geraldine Knight-Scott fellowship to travel around the world and study human adaptations to floods. He holds B.S. in natural resources from Cornell University and an M.L.A. in environmental planning from UC Berkeley.

B. Four Fox Consultants

Mary M. Conner, Ph.D., received her doctorate in Wildlife Biology from Colorado State University in 1999. Dr. Conner's dissertation work entitled, "Elk movement in response to early-season hunting in the White River area, Colorado" explored the effects of resource management decisions on population dynamics of Elk. Her focus during both graduate and post-graduate work has been in quantitative ecology, estimation of population parameters, and population dynamics modeling. Specifically, Dr. Conner uses these tools on long term data sets to evaluate effects of management actions or environmental factors in the face of temporal and/or spatial variation. As part of her work on long term or large data sets, she also has developed expertise in simulation studies, experimental design, and various mixed effects modeling. Since completing her Ph.D. she has been working as a post-doctoral fellow investigating mule deer movements in relation to spatial patterns of chronic wasting disease prevalence in Colorado. Dr. Conner has also been working for 4 Fox Consultants on analysis of various long term data sets and experiments.

C. University of California, Berkeley

Sally K. Fairfax, Ph.D., received a doctorate in public administration and a Masters of forestry from Duke University in 1974. Professor Fairfax is currently the Henry J. Vaux Distinguished Professor of Forest Policy in the College of Natural Resources at the University of California, Berkeley. Professor Fairfax considers herself a student of land conservation, with a primary focus on public resources law and administration. Most of her academic work appears in law reviews;

however, she has recently written a number of books as well. She is co-author, with Carolyn Yale, of *The Federal Lands* (Island Press). She is also author of the second edition of Samuel Trask Dana's classic text, *Forest and Range Policy*. Her most recent work concerns the notion of a trust as an antidote to vacuous multiple use concepts, which dominate thinking about federally owned public resources. Her most recent book, *Conservation Trusts*, with Darla Guenzler, focuses on private and public conservation efforts and was published in 2001. She is presently completing a volume on land acquisition for conservation and the emergence of Land Trusts. In addition to her academic work, Professor Fairfax has an extensive record of administrative service including administrative intern to Provost Doris Calloway, Title IX Coordinator on the Berkeley Campus between 1988 and 1990, Associate Dean for Research and later Associate Dean for Instruction and Student Affairs in the College of Natural Resources. Fairfax has also served on the board and on numerous committees of the National Academy of Science and as the Chair of the Central California Coastal Biosphere Reserve, a UN MAB project. She was selected as the 2000 Aldo Leopold Lecturer in Conservation at the University of Wisconsin, Madison and is the inaugural holder of the Henry J. Vaux Distinguished Professorship in Forest Policy.

II. LIST OF LETTERS OF SUPPORT

County	Agency/Organization	Contact	Project Name
Shasta	Western Shasta RCD	Hide Wenham	Lower Clear Creek Floodway Restoration Project
Modoc	Modoc RCD	Cliff Harvey	Upper Pit River Watershed Enhancement and Protection Program
Plumas	Plumas Corp	Jim Wilcox	Various Projects on the Feather River and tributaries
Lake	East Lake and West Lake RCD's	Greg Dills	Middle Creek Ecosystem Restoration Program and Schindler Creek
Nevada	Friends of Deer Creek	John van der Veen	Restoring Deer Creek: Overcoming the Legacy of the Gold Mine Era
Alameda	Friends of Codornices Creek	Juliet Lamont	Codornices Watershed Restoration Action Plan
Alameda	Friends of Sausal Creek	Charlotte Bells	Upper Sausal Creek Channel Restoration Program
Contra Costa	Delta Science Center	Steve Barbata	Marsh Creek and Dutch Slough Projects
Contra Costa	Urban Creeks Council/NHI	Rich Walkling	Rheem Creek Restoration Project

III. PROOF OF NON-PROFIT STATUS

INTERNAL REVENUE SERVICE
DISTRICT DIRECTOR
3 CORPORATE CIRCLE
MONTEREY PARK, CA 91755-7426

DEPARTMENT OF THE TREASURY

Date: MAY 04 1994

Employer Identification Number:
94-3099630
Case Number:
954118CR
Contact Person:
TONG TSONAS
Contact Telephone Number:
(213) 894-2285
Our Letter Dated:
November 09, 1993
Addendum Applies:
No

INSTITUTE FOR THE NATURAL HERITAGE
3199 SCOTT DR BLDG 5
APTOS CA 95003-4017

Dear Applicant:

This modifies our letter of the above date in which we stated that you would be treated as an organization that is not a private foundation until the expiration of your advance ruling period.

Your exempt status under section 501(a) of the Internal Revenue Code as an organization described in section 501(c)(3) is still in effect. Based on the information you submitted, we have determined that you are not a private foundation within the meaning of section 509(a) of the Code because you are an organization of the type described in section 509(a)(1) and 170(b)(1)(A)(vi).

Grantors and contributors may rely on this determination unless the Internal Revenue Service publishes notice to the contrary. However, if you lose your section 509(a)(1) status, a grantor or contributor may not rely on this determination if he or she was in part responsible for, or was aware of, the act or failure to act, or the substantial or material change on the part of the organization that resulted in your loss of such status, or if he or she acquired knowledge that the Internal Revenue Service had given notice that you would no longer be classified as a section 509(a)(1) organization.

If we have indicated in the heading of this letter that an addendum applies, the addendum enclosed is an integral part of this letter.

Because this letter could help resolve any questions about your private foundation status, please keep it in your permanent records.

If you have any questions, please contact the person whose name and telephone number are shown above.

Sincerely yours,

Richard R. Orosco
District Director

Letter 1050 (DO/CG)